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I, LEANNE MYNOTT, MANAGER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2003907151 for a patent by THE AUSTRALIAN STEEL COMPANY (OPERATIONS) PTY LTD as filed on 23 December 2003.

WITNESS my hand this
Twelfth day of January 2005

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Regulation 3.2

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Patents Act 1990

PROVISIONAL SPECIFICATION

Invention Title: **Cavity former**

The invention is described in the following statement:

CAVITY FORMER

Field of the Invention

This invention relates to concrete slabs and foundations. More specifically, the invention relates to an apparatus for forming a hollow cavity in a slab or foundation.

Background of the Invention

The practice of using cavity formers as space filling members in the preparation of a concrete slab or foundation is an existing technique for reducing the amount of concrete required to form a slab or foundation. While the reduced concrete content in a slab having hollow cavities serves to reduce the cost of the slab, it also advantageously allows the slab to be built on unstable soil as expanding soils will flow into the formed cavities. Such cavities also assist the easy placement of electrical and plumbing conduits throughout the slab.

As the cavity formers must be sufficiently strong to support, firstly, the weight of workers when the formers are in place prior to a pour and, secondly, the load of wet concrete when it is poured, they are prefabricated remote from the building site in standard sizes and then delivered to the building site ready to be set in place prior to pouring of the concrete. Known cavity formers include multiple web reinforced cardboard or fibreboard boxes and so called pods of foamed polymeric material, for instance polystyrene.

Cardboard or fibreboard formers must have sufficient structural integrity to support the wet slab for a prescribed period, eg 3 hours, after a concrete pour, before they weaken through moisture absorption. Polystyrene overcomes this limitation, but it has the disadvantage that, when cut into smaller shapes for cavities of smaller sizes, large quantities of fine polystyrene particles are often generated. Such polystyrene particles present an environmental problem because they are easily scattered by a breeze. Furthermore, polystyrene pods do not disintegrate to more completely form the cavity and this presents a disposal and environmental problem when the slab is partially or wholly demolished or reshaped. For these reasons, the use of polystyrene as a cavity former is being restricted in at least the United States.

Typically, slab formation preparations involve arrangement of the cavity formers into a spaced relative configuration. Bar chairs are then located in the spaces between the cavity formers to receive bar reinforcement and thereby to form a lattice of bar reinforcement surrounding the cavity formers. Bar chairs are also located on the tops of the cavity formers to support mesh reinforcement that is laid in a blanket covering. After these preparations the wet concrete is poured and cures to form the concrete slab or foundation. A similar process is described in Australian patent 584769 to Koukourou & Partners Pty Ltd.

The process of arranging the cavity formers and bar chairs and then accurately locating the bar and mesh reinforcement on the bar chairs is time consuming and inconvenient.

It is an object of this invention to provide an improved cavity former which, at least in part, alleviates one or more of the problems mentioned above. Advantageously, the improved cavity former has optimum versatility and enables faster slab formation preparations.

Summary of the Invention

According to a first aspect, the invention provides a cavity former for forming cavities in a concrete slab, said cavity former including:

a hollow body about which poured concrete flows and subsequently cures to form a cavity in the concrete slab; and

supports integrated with the body and upstanding therefrom to support rectangular mesh reinforcement spaced above the body in any orientation relative to the cavity former whereby mesh reinforcement randomly dropped onto an array of cavity formers will rest on the supports above the bodies of the cavity formers.

The hollow body may be a rectangular pod open on a lowermost side. In the preferred embodiment, the cavity former has a plurality of bodies spaced apart by integrally formed channels that receive elongated slab-reinforcement. The supports are preferably arranged and spaced so that if the mesh reinforcement is randomly dropped onto an array of cavity formers, the mesh reinforcement will rest on the supports above the bodies. Seats may be integrally formed in the channels to link adjacent pods and to support the elongated slab-reinforcement located in

the channel. Preferably, the seats automatically center the elongated slab-reinforcement longitudinally within the respective channel.

The invention provides, in a second aspect, a cavity former for forming cavities in a concrete slab, said cavity former including:

a plurality of hollow bodies about which wet concrete flows and subsequently cures to form cavities in the concrete slab, wherein said hollow bodies are spaced by channels and are linked by seats that automatically center elongate slab-reinforcement located within the channel, said seats are integral with the cavity former and traverse substantially the whole of the width of the channel between spaced bodies.

The bodies, in the second aspect, preferably include integrally formed supports upstanding from the bodies to support rectangular mesh reinforcement above the body in any orientation relative to the cavity former.

According to both the first and second aspects, the seats are preferably parabolic in shape to enable automatic centering of the slab-reinforcement within the channels.

According to the preferred embodiment of the first and second aspects, the supports are elongate and intersect to provide a cruciform shape for supporting the mesh reinforcement in any orientation relative to the cavity former. As multiple cavity formers are transported in a stacked arrangement, the bodies are formed with inclined peripheral walls to facilitate nesting of stacked cavity formers. Moreover, the supports are hollow to receive the upwardly extending supports of a stacked cavity former to further assist nesting.

In a third aspect, the invention provides a cavity former for forming cavities in a concrete slab, said cavity former including:

a plurality of hollow bodies about which wet concrete flows and subsequently cures to form cavities in the concrete slab; and

channels integrally formed with said bodies to space said bodies apart such that slab reinforcement is receivable within the channels to reinforce the formed concrete slab.

The cavity former according to the third aspect may include seats that link adjacent bodies and that automatically centre elongate slab-reinforcement located within the channels. Preferably, the seats are integral with the cavity former and traverse substantially the whole of the width of the channel between spaced bodies.

Integrated mesh reinforcement supports, as described above in respect of the first and second aspects, may be included in the cavity former according to the third aspect.

The cavity formers according to each aspect of the invention may include tabs for connecting adjacent cavity formers thereby to inhibit movement of individual cavity formers during pouring of the wet concrete. The bodies of the cavity formers are defined by separable compartments to enhance the strength of the cavity former and to enable the shape of the bodies to be customised.

Preferably, the supports, in a cavity former including a plurality of bodies, are arranged and spaced to cover a corresponding location on each body. The supports may be located on the corresponding separable compartment of each body.

Brief Description of the drawings

A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of two connected cavity formers, embodying the first and second aspects of the invention, one of which is laid out with bar and mesh reinforcement in preparation for wet concrete to be poured to form a concrete slab;

Figure 2 is a section of the cavity former in Figure 1 (along the line 2-2) that is not covered by mesh reinforcement, which cavity former is accompanied by a similar section of a nesting cavity former shown in dashed lines;

Figure 3 is a section of the cavity former in Figure 1 (along the line 2-2) that is not covered by mesh reinforcement, which cavity former is connected to part of the adjacently arranged cavity former (also in section) shown in dashed lines; and

Figure 4 is a top plan view of the cavity former in Figure 1 without mesh or bar reinforcement.

Description of the preferred embodiment

Figure 1 shows cavity formers 10 in accordance with the present invention arranged with reinforcing products, such as mesh reinforcement 12 and bar reinforcement 14 supported by the cavity formers 10, in preparation for pouring of the concrete to form a slab or foundation. It will be appreciated that the wet concrete is poured about the cavity formers such that the cured concrete slab has hollow sections in the shape of the cavity formers 10.

Referring now to Figure 2, the cavity former 10 includes four hollow pods 20 arranged in a rectangular configuration and which pods 20 are spaced by channels in the form of trenches 40. The pods 20 and trenches 40 are integrally formed to space the pods 20 apart such that slab reinforcement is receivable within the trenches 40 to reinforce the formed concrete slab. The integrally formed pods 20 and trenches 40 are formed of moulded plastics or any other suitable material.

Each pod 20 includes, on its top surface 28, an integrally formed support, in the form of hollow upstanding ridges 30, for mesh reinforcement 12 placed on the cavity former 10. Mesh reinforcement 12 supported by the ridges 30 is held in a spaced relationship above the pod 20. The ridges 30 are arranged to define a cruciform shape such that the mesh reinforcement 12 is supported above the pod 20 for any given orientation of the mesh reinforcement 12 relative to the pod 20 such that whereby mesh reinforcement randomly dropped onto an array of cavity formers will rest on the supports above the bodies of the cavity formers.

The pods 20 have peripheral walls 22 that taper inwardly toward top surface 28 such that multiple cavity formers 10 may nest, when stacked, to provide a reduced volume to facilitate transport to a construction site. Nesting is aided by the hollow ridges 30 which receive the ridges 30 of a nesting cavity former 10 (Figure 2).

Intersecting minor channels, in the form of valleys 24, are formed in each pod to provide separate hollow compartments 26 and provide the pods with greater strength for supporting the weight of workers prior to the wet concrete being poured, the mesh when laid and the weight of wet concrete once poured. The compartments 26 are selectively separable from pods 20 at valleys 24 to customise the shape of the cavity former 10 as required. The valleys 24 extend

the height of the walls 22 to ensure that the ability of the compartments 26, remaining after one or more compartments 26 have been removed, to form cavities in the poured concrete is not compromised. While the valleys 24 are arranged in a cruciform shape, it will be appreciated that the valleys 24 may be arranged in other configurations to provide differently shaped separable compartments 26.

The supports 30 are arranged and spaced to cover a corresponding location on each pod 20. In Figures 1 and 4, the supports are located on corresponding separable compartments 26 of each pod 20.

In accordance with a first aspect of the invention, an alternative embodiment of the cavity former 10 includes a single pod 20 and integrated ridges 30 as described above with or without the valleys 24. This embodiment has the same advantages as described above, i.e. enabling the mesh reinforcement to be supported on the pod 20 in any orientation relative to the cavity former 10 and avoiding the necessity for bar chairs to support the mesh.

In accordance with the second aspect of the invention, the pods 20 are linked by seats for supporting bar reinforcement 14. The seats are integrally formed in the trenches 40. In one embodiment, the seats are provided by the floor of the trench 40 having a shape that automatically aligns the bar reinforcement longitudinally within the trench 40, i.e. parabolic. In the preferred embodiment, however, the seats are provided in the form of saddles 42 integrally formed in the trenches 40 to link opposed pods 20 (Figures 2 and 4). In each embodiment, the seats are formed with a parabolic shape and traverse substantially the whole width of the trenches 40 to enable automatic centering of bar reinforcement dropped into the trenches 40.

The saddles 42 respectively located in the perpendicularly arranged trenches 40 are vertically offset to ensure that bar reinforcement 14 in one trench 40 does not interfere with bar reinforcement 14 located in a perpendicular trench 40 at the point where the trenches 40 intersect.

While the seats may have a parabolic profile, it will be appreciated that any other shapes suitable for automatically centering bar reinforcement 14 in a trench 40

may alternatively be used. For example, the saddles may have a v-shaped profile spanning the substantial width of the trenches 40.

A pair of upwardly turned tabs 50 are located on two adjacent sides of the cavity former 10 to link adjacently arranged cavity formers in situ (Figure 3). By linking adjacent cavity formers 10 together, individual cavity formers 10 are prevented from shifting during the pouring of the wet concrete. Accordingly, the cavity formers 10 will maintain their original positioning.

Rounded depressions 52 are formed in the upper sides of the pods 20 to provide hook points for attachments to lift the cavity former 10 or a plurality of nesting cavity formers 10 when they are upturned. Typically nesting cavity formers 10 are turned upside down for transport as the ridges 30 on the lowermost cavity former 10 provide a clearance between the upper surface 28 of the pods 20 and the ground. This clearance enables suitable lifting means, such as a fork lift, to slide underneath the nesting cavity formers 12 and pick them up.

The slab formation preparations, using the cavity formers 10, involve delivering a plurality of the cavity formers 10, in the nested arrangement, to the construction site. One or two workers may then place individual cavity formers 10 in a position such that they are linked by the upturned tabs 50. Customised shaping of the cavity formers 10 will take place at this time to ensure the proper shaping of the cavity formers 10. Once positioned, the trenches 40 of adjacent cavity formers 10 will be in alignment, thereby enabling bar reinforcement 14 to be dropped directly into the trenches for automatic centering on saddles 42. Accordingly, separate spaces are not required to achieve the correct spacing between adjacent pods 20 and, moreover, the use and positioning of bar chairs in the tenches 40 is not required. This, therefore, saves time in preparing for the wet concrete to be poured.

Mesh reinforcement 12 is then located on the cavity formers 10 for support by the ridges 30. As the cruciform arrangement of the ridges 30 enables the mesh reinforcement 12 to be located on the cavity former in any orientation relative thereto, more time is saved because specific mesh reinforcement 12 orientations are not required.

Typically the cavity formers 10 are square and having side lengths in the range of 800-1600 millimetres, but preferably 1000-1200 millimetres. They may be formed with a height in the range of 150-400 millimetres, but specifically may be fabricated with 175, 225, 300 or 375 millimetre heights. The cavity formers 10 are composed of a suitable plastics material to support the weight of wet concrete bearing down on the cavity former during curing, or the weight of a person standing on the cavity former. For example, the cavity formers are formed to support a 150 kilogram point load. For the concrete curing process, the cavity formers 10 are able to support about 280 kilograms per square metre.

By their Registered Patent Attorneys

Freehills Carter Smith Beadle

23 December 2003

The Australian Steel Company (Operations) Pty Ltd

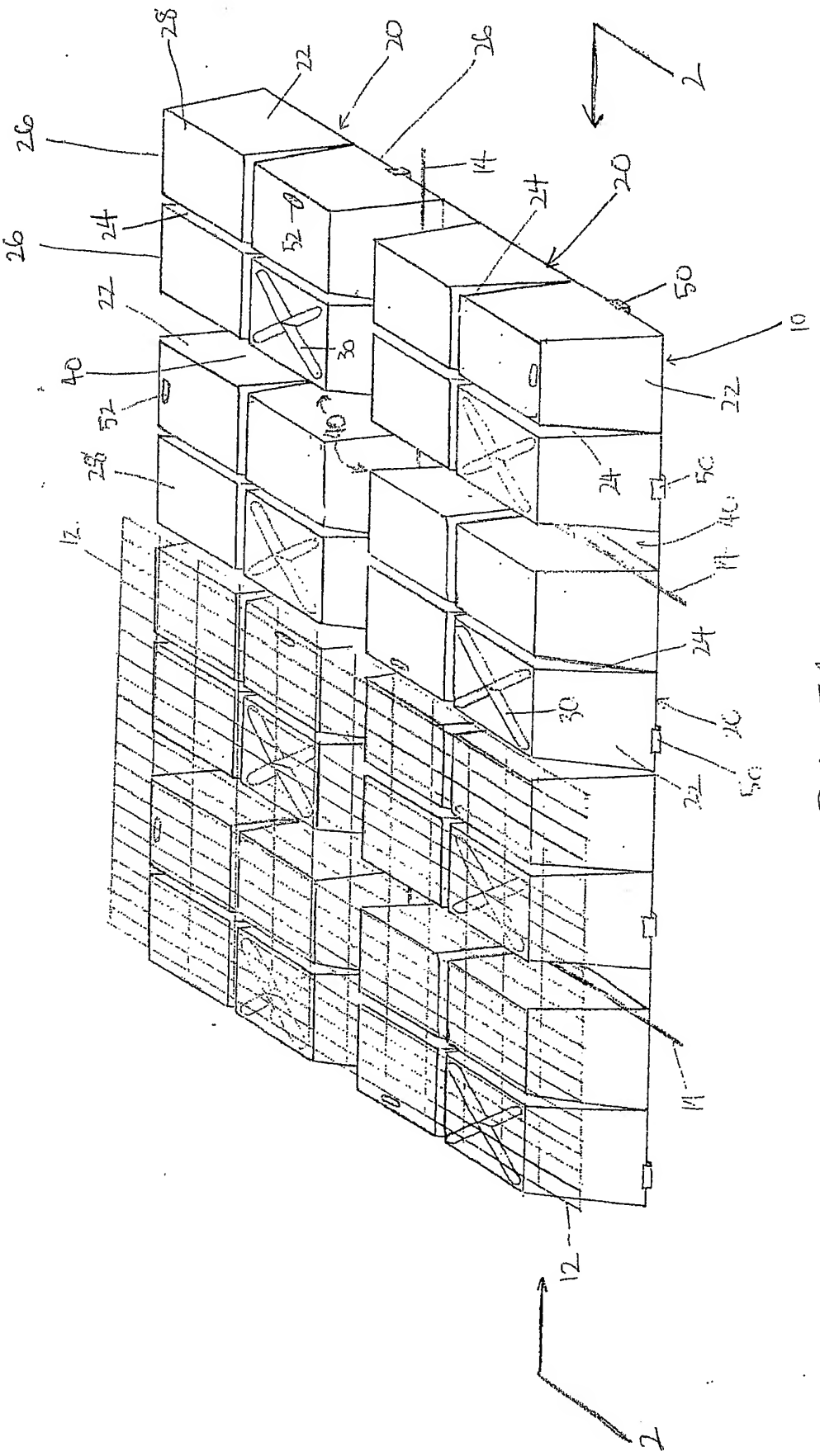

FIGURE 1

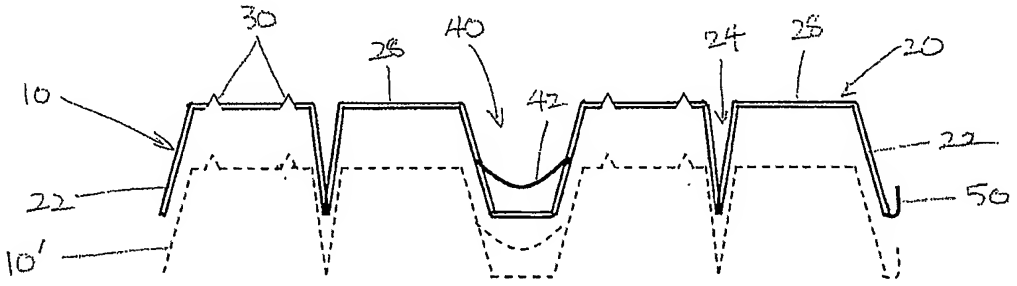

FIGURE 2

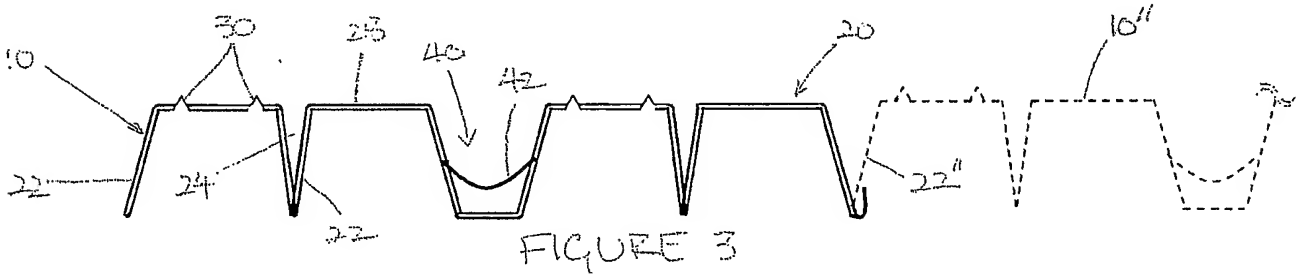

FIGURE 3

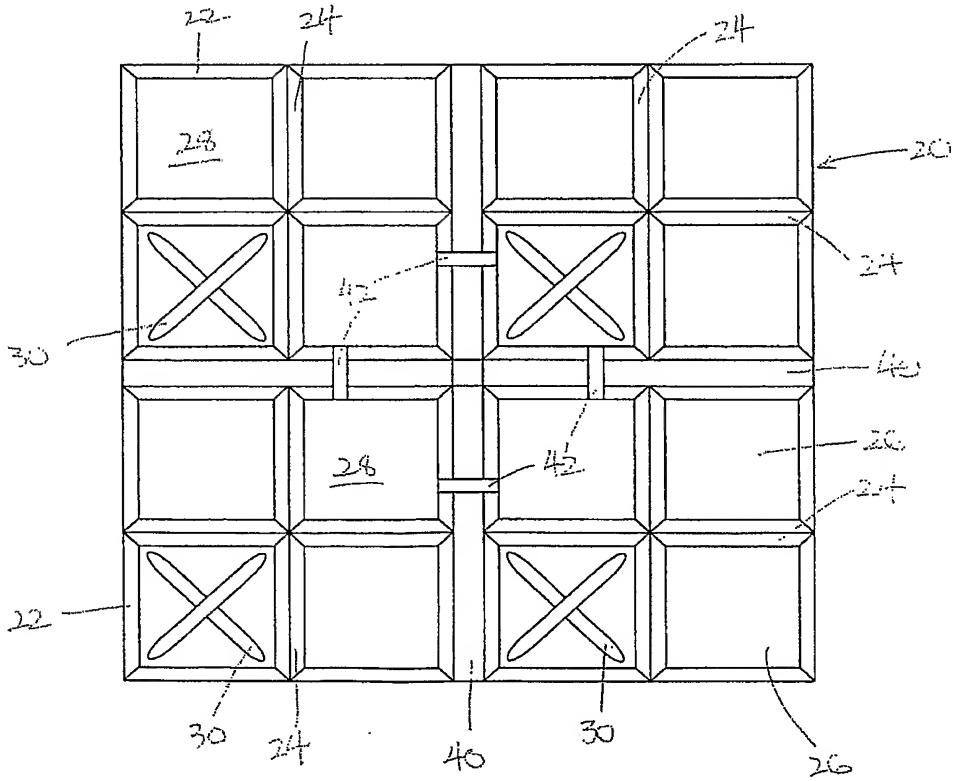

FIGURE 4